Appl. No. 10/690,999
Examiner: Goudreau, George A., Art Unit 1763
In response to the Office Action dated September 23, 2004

Date: December 23, 2004
Attorney Docket No. 10113091

REMARKS

Applicant thanks the Examiner for acknowledging Applicant's claim to foreign priority and receipt of the certified copy of the priority document. Responsive to the Office Action mailed on September 23, 2004 in the above-referenced application, Applicant respectfully requests amendment of the above-identified application in the manner identified above and that the patent be granted in view of the arguments presented. No new matter has been added by this amendment.

Present Status of Application

After this amendment, claims 1-6 and 8-29 remain pending. Claims 1-29 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 1, 5, 7, 10 and 12-14 stand rejected under 35 U.S.C. 102(e) as being anticipated by En-Ho et al (US 2003/0143852). Claims 1-10 stand rejected under 35 U.S.C. 102(b) as be anticipated by Kim (US 6,339,004). Claims 4, 6, 8-9, and 11 stand rejected under 35 U.S.C 103(a) as being unpatentable over En-Ho et al. Claims 4, 7-9, and 11 stand rejected under 35 U.S.C 103(a) as being unpatentable over Kim.

In this paper, claim 1 is amended to recite a method for forming trench isolations including a step of lowering the first dielectric layer below the opening of the trench by performing anisotropic etching and wet etching. Support for this amendment can be found in Figs. 2B-2C, page 7, lines 3-18 of the specification. Claims 8-9, 16 and 21-3 are amended as described in further detail below. Claim 7 is canceled. The specification is amended to better describe the steps illustrated in the drawings and correct typographical errors.

Reconsideration of this application is respectfully requested in light of the amendments and the remarks contained below.

Rejections Under 35 U.S.C. 112

Claims 1-29 stand rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as

the invention. Namely, the office action states that the wording used in claims 1, 7-9, 16 and 21-23 is written in a confusing manner.

In this paper, claims 1 and 16 are amended to more clearly recite that the first dielectric layer is lowered below the opening(s) of the trench(es) by etching. Claims 8 and 22 are amended to more clearly recite that the first dielectric layer is lowered about 100~1000Å below the opening of the trench. Claims 9 and 23 are amended to more clearly recite that HDPCVD is successively performed with a relatively low deposition/sputtering ratio and a relatively high deposition/sputtering ratio. Claim 21 is amended to cancel the wording "in order". Claim 7 is canceled.

Applicant submits that the rejections of claims 1-29 under 35 U.S.C. 112, second paragraph, are overcome by these amendments.

Rejections Under 35 U.S.C. 102(e)

Claims 1, 5, 7, 10 and 12-14 stand rejected under 35 U.S.C. 102(e) as being anticipated by En-Ho et al. To the extent that the grounds of the rejections may be applied to the claims now pending in this application, they are respectfully traversed.

En-Ho et al teaches a method of forming a high aspect ratio shallow trench isolation. As disclosed in paragraph [0017] and Fig. 1D of En-Ho et al, a portion of the first oxide layer 112 is etched to a certain depth of the high aspect ratio shallow trench 180 using dry etching ***or*** wet etching to expose the void 114.

En-Ho et al do not teach or suggest a method for forming trench isolations comprising, *inter alia*, a step lowering the first dielectric layer below the opening of the trench by performing anisotropic etching ***and*** wet etching, as recited in claim 1.

MPEP 2131 prescribes that to anticipate a claim, a reference must teach every element of the claim. In this regard, the Federal Circuit has held:

> "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).
>
> "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Claim 1 recites a method for forming trench isolations comprising, *inter alia*, a step lowering the first dielectric layer below the opening of the trench by performing anisotropic etching ***and*** wet etching. The anisotropic etching and wet etching performed on the first dielectric layer ensure that the top portion of the trench sidewalls is free from oxide formed by LPCVD, and the surface of the first dielectric layer can be lowered below the opening of the trench. See Fig. 2C and lines 10-18 of page 7 of the application. Claim 8 recites that the first dielectric layer is lowered about 100~1000Å below the opening of the trench.

In contrast, En-Ho et al teaches a portion of the first oxide layer 112 is etched to a certain depth of the high aspect ratio shallow trench 180 using dry etching ***or*** wet etching to expose the void 114.

For at least this reason, it is Applicant's belief that claim 1 is allowable over the cited reference. Insofar as claims 26 and 8-15 depend from claim 1, it is Applicant's belief that these claims are also in condition for allowance.

Rejections Under 35 U.S.C. 102(b)

Claims 1-10 stand rejected under 35 U.S.C. 102(b) as be anticipated by Kim. To the extent that the grounds of the rejections may be applied to the claims now pending in this application, they are respectfully traversed.

Kim teaches a method of forming shallow trench isolations for preventing torn oxide. As disclosed in column 3, lines 21-25 and Fig. 2C of Kim, nitride layer 14 is etched using a dry

etching method such as plasma etching. The dry etching is anisotropically performed with respected to the nitride 14 while being approximately normal to the surface of the silicon wafer 11.

Kim does not teach or suggest a method for forming trench isolations comprising, *inter alia*, a step lowering the first dielectric layer below the opening of the trench by performing anisotropic etching ***and*** wet etching, as recited in claim 1.

Kim teaches etching nitride layer 14 using a dry etching method such as plasma etching. Nowhere in Kim is it taught or suggested etching the nitride layer 14 below the opening of the trench by performing anisotropic etching ***and*** wet etching as recited in claim 1 of the present application. As described above, the anisotropic etching and wet etching performed on the first dielectric layer ensure that the top portion of the trench sidewalls is free from oxide formed by LPCVD, and the surface of the first dielectric layer can be lowered below the opening of the trench. Claim 8 recites that the first dielectric layer is lowered about 100~1000Å below the opening of the trench.

Kim does not teach or suggest a method for forming trench isolations comprising, *inter alia*, a step forming a second dielectric layer on the first dielectric layer and filling the trench to form a trench isolation by high density plasma chemical vapor deposition (HDPCVD), as recited in claim 1.

Kim discloses depositing a trench-filling oxide 15 with a thickness of 8000-10000Å onto the entire surface of the silicon wafer 11 through a high-pressure CVD method such that the trench is completed buried by the trench-filling oxide 15. See column 3, lines 31-36 and Fig. 2C of Kim. In contrast, claim 1 recites forming a second dielectric layer on the first dielectric layer and filling the trench to form a trench isolation by high density plasma chemical vapor deposition (HDPCVD).

As Kim fails to teach each and every element as set forth in claim 1, it is Applicant's belief that claim 1 is allowable over the cited reference. Insofar as claims 2-6 and 7-15 depend from claim 1, it is Applicant's belief that these claims are also in condition for allowance.

Rejections Under 35 U.S.C. 103(a) Over En-Ho et al

Claims 4, 6, 8-9, and 11 stand rejected under 35 U.S.C 103(a) as being unpatentable over En-Ho et al. To the extent that the grounds of the rejections may be applied to the claims now pending in this application, they are respectfully traversed.

Under 35 U.S.C. 103(c), subject matter developed by another person which is prior art under subjections 35 U.S.C. 102(e), (f) and (g) shall not preclude patentability under 35 U.S.C. 103 where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an assignment to the same person.

Statement Under 35 U.S.C 103(c)

Application No. 10/690,999 and US Patent Application Publication No. US2003/0143852 A1 to Nanya Technology Corporation were, at the time the invention of Application No. 10/690,999 was made, owned by Nanya Technology Corporation.

Applicant thefore submits that En-Ho et al is disqualified as prior art under 35 U.S.C. 103(a) and requests that the rejections of claims 4, 6, 8-9, and 11 over En-Ho et al be withdrawn. For this the reason, the Examiner's arguments in connection with these claims are considered moot and will not be addressed here.

Rejections Under 35 U.S.C. 103(a) Over Kim

Claims 4, 7-9, and 11 stand rejected under 35 U.S.C 103(a) as being unpatentable over Kim. To the extent that the grounds of the rejections may be applied to the claims now pending in this application, they are respectfully traversed.

As noted above, it is Applicant's belief that that claims 4, 7-9, and 11 are allowable by virtue of their dependency from claim 1. For this the reason, the Examiner's arguments in connection with these claims are considered moot and will not be addressed here.

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Claims 16-29

Neither En-Ho et al nor Kim teach or suggest the limitations of "providing a substrate with a first trench with a relatively high aspect ratio and a second trench with a relatively low aspect ratio therein", "forming a first dielectric layer on the substrate and filling the trenches by LPCVD", "lowering the surface of the first dielectric layer below the openings of the both trenches by etching, wherein the first dielectric layer forms a spacer on the sidewalls of the second trench", and "forming a second dielectric layer on the first dielectric layer and filling both trenches to form trench isolations by HDPCVD" recited in the amended claim 16.

As the rejections of claims 16-19 under 35 U.S.C. 112, second paragraph, are believed to have been overcome by the amendment to claim 16, it is Applicant's belief that claims 16-19 are now in condition for allowance.

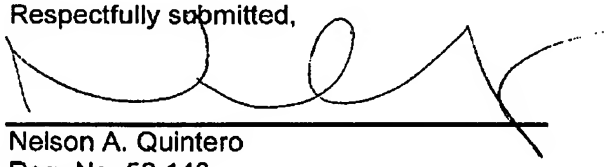
Information Disclosure Statement

The Examiner is advised that an information disclosure statement was filed in connection with this application on September 23, 2004.

Conclusion

The Applicant believes that the application is now in condition for allowance and respectfully requests so.

Respectfully submitted,



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